Global Ocean Data Assimilation Experiment (GODAE) High Resolution Sea Surface Temperature Pilot project (GHRSST-PP)

Implementation Plan

v0.2

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Executive Summary

The Global Data Assimilation Experiment (GODAE) high-resolution sea surface temperature pilot project (GHRSST-PP) has been established to give international focus and coordination to the development of a new generation of global, multi-sensor, high-resolution, SST products. This document describes in detail the implementation plan of the project and should be considered together with the GHRSST-PP Strategy and Initial Implementation plan. Following a period of preparation throughout 2002, during the 2003-2005 GODAE demonstration phase, the GHRSST-PP will clearly demonstrate the operational advantages and value of including global data sets in climate and ocean modelling by the delivery of a demonstration data set.

This document provides a working document describing in detail, the implementation plan for the GHRSST-PP. It is the product of a 4-day workshop held at the EORC, Tokyo Japan held during the 13-16th May 2002.

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1 Background

The Global Data Assimilation Experiment (GODAE) high-resolution sea surface temperature pilot project (GHRSST-PP) has been established to provide international focus and coordination for the development of a new generation of global, multi-sensor, high-resolution, sea surface temperature (SST) products. A full description of the GHRSST-PP is provided in the GHRSST-PP Strategy and Initial Implementation plan (Donlon, 2002) that is the primary GHRSST-PP scientific reference document.   Following a brief summary of the GHRSST-PP, a detailed work plan is presented in section 2. The aim of the GHRSST-PP is to:

> ❖ **Ensure the provision of rapidly and regularly diffused, high-quality sea surface temperature products at a fine spatial and temporal resolution, that meet the diverse needs of GODAE, the scientific community, operational users and climate applications at a global scale.**

The most promising way to achieve the GHRSST-PP aim is to combine observations from complementary infrared (IR) and passive microwave (PM) satellite sensors on polar-orbiting and geostationary platforms together with quality controlled in situ observations from ships and buoys. Each satellite sensor type has unique benefits but individual limitations and i*n principle, the merging of these complementary measurements can deliver SST products with enhanced accuracy, spatial and temporal coverage.* One approach relies on wide-swath high resolution IR data from polar orbiting sensors such as AVHRR, MODIS and GLI to provide a high-resolution base data set. Passive microwave (PM) data from TMI and AMSR could be used to overcome the worst problems of cloudy areas. Geostationary satellite data such as those from GOES, SEVIRI and GMS could be used to account for diurnal variability and, in situ data may constrain, test and check all of the satellite data. Other approaches employ the use of numerical and statistical modelling to provide combined sensor SST data sets that account for the cool skin of the ocean and thermal stratification (e.g., Kawamura, 2002) or utilize the unique measurements of the AATSR to provide a robust "calibration" data source for new "multi-sensor" SST algorithms.

A fundamental tenet of the GHRSST-PP is the establishment and coordination of a GHRSST-PP network of users, agencies and scientists that collectively provide and use large internationally distributed data sets, in near real time. In today's "global village" this level of interconnectivity is now possible but it can only be realised through carefully coordinated dialogue and fostered cooperation. The GHRSST-PP provides a unique international framework in which scientists, users and agencies *already engaged in activities* working with satellite and in situ SST data are encouraged to interact, exchange data and science thereby minimising any duplication of effort and maximising SST data potential. Only where necessary will additional projects and funding be targeted. ***This is important because unlike a national or international research program, there is no dedicated funding for GODAE or the GHRSST-PP.***

The success of the GHRSST-PP depends on the correct specification, generation and distribution of mutually beneficial GHRSST-PP SST products that are available in a timely fashion. Innovative but robust data merging strategies and methods have to be developed to optimise the resolution, coverage, accuracy and temporal characteristics of input data. These have to be carefully balanced not only against limitations of data availability and throughput, but also against available human and computer resources. The GHRSST-PP implementation plan focuses on existing national and international activities and in particular, those related to the exchange of satellite and in situ SST data, validation and quality control of SST data, operational and scientific SST research and near real time SST applications.

1.1 GHRSST-PP Objectives

Five clear GHRSST-PP strategic objectives have been established:

1. Identify data providers (including measurements of SST from satellite and in situ sources and satellite data (e.g., brightness temperature) from which SST observations are derived) and data users across all application sectors and establish data access agreements, timely data exchange routes, protocols and services.

2. Characterize the quality of existing satellite and in situ SST data sources through validation exercises and identify differences between them by inter-comparison at local, regional and global spatial scales and for daily, weekly and monthly temporal scales.

3. Develop innovative data integration and assimilation methods that exploit existing SST datasets through data merging/fusion in order to generate improved multi-sensor SST products.

4. Identify and promote the research and development needed to address outstanding issues concerning, for example, the access to and exchange of data, merging of complementary SST data streams, appropriate cloud clearing strategies and SST algorithms.

5. Implement GHRSST-PP methods as a demonstration system to provide timely SST products that are responsive to user requirements during the 2003-2005 GODAE demonstration period.

1.2 Expected outcomes of the GHRSST-PP

The GHRSST-PP will bring together many major international and national projects of differing scope and budget. It will ensure that scientists, data producers, and remote sensing specialists concerned with SST data at a global level are participating in earth observation innovation, policy, decision-making and strategy formulation. It will also ensure that duplication of activities is minimized and synergy benefits of collaborative activities are maximized through synchronization of procedures, techniques, algorithms and data formats associated with the use and development of a long term, multi-sensor satellite SST data set. In particular, the project will foster better exploitation of existing data and adaptation of existing observing systems through the co-ordination of data integration methods, strategies and frameworks. These are required to fully capitalize on the complementary aspects of in situ observations together with satellite infrared and microwave satellite data sets.

The GHRSST-PP will improve the quality and usefulness of space-based SST for applications in operational ocean monitoring and forecasting for marine industries, for the establishment of climate baselines and detection of climate change, and for oceanographic science applications. It will demonstrate an operational system with the involvement of many international actors from data providing agencies to end users throughout the project life cycle. It will ensure that the highest quality data sets are generated in an operationally efficient manner encouraging a sustained capability in operational services for monitoring SST from space. Ultimately, it will provide the tools, methods and research required to implement an operational system for the production of a new generation of global SST.

GHRSST-PP demonstration data products are relevant to many agencies and institutions tasked with the study of climate variability, operational meteorology, weather forecasting, military

operations, ocean and atmospheric modelling validation and forcing, ecosystem assessment and fisheries research. Significant national funding has been committed to the development and operation of new satellite platforms and sensors (e.g., AATSR, AMSR, SEVIRI, MODIS, GLI, TMI) in order to preserve the long-term monitoring of the global ocean. The GHRSST-PP will ensure that data derived from existing and future sensors are used to their fullest extent, guaranteeing maximum return on investment. The proposed objectives, thematic work program and deliverables of the GHRSST-PP are focused on these priorities.

2 GHRSST-PP work plan

Five interconnected principal project components (PPC) are schematically described in Figure 2.1. Here, the concept for a framework that integrates data from existing international data sources using state-of-the-art communications and analysis tools and generates new merged SST products is presented. The GHRSST-PP PPC, cast as work packages, are:

WP1000. Project management and coordination.
Overall management and coordination of all GHRSST-PP activities.

WP2000. GHRSST-PP user information service (UIS)
This co-ordinates and manages all interactions with the GHRSST-PP user community including general information, project contacts, data access, product descriptions, metadata repository, master index of GHRSST-PP datasets and, all user feedback.

WP3000. A dynamic distributed database (DDD)
This is a virtual database system that will coordinate access and exchange of existing international satellite and in situ SST data (e.g., held by international GDAC, DAAC and SAF) each with a characteristic spatial resolution, sampling frequency and accuracy, for use within the GHRSST-PP. The DDD will also coordinate access and dissemination of all GHRSST-PP products. In its simplest form, the DDD may be realised as a list of specific ftp, DODS, LAS or other servers and more advanced solutions are not precluded.

WP4000: A Diagnostic data set (DDS)
This is a quality analysis facility that includes a set of activities that test, inter-compare and validate input SST data streams considered by the GHRSST-PP at local, regional and global time-scales and at a variety of spatial resolutions. At its core is the concept of a diagnostic data set (**DDS**). The DDS will contain high-resolution satellite data contemporaneous with other satellite data and where possible, in situ observations for globally distributed "DDS-sites" that adequately represent all global climatic regimes. The DDS provides a means to validate GHRSST-PP products.

WP5000: Satellite data integration (SDI)
Software tools that access and merge internationally distributed SST datasets in order to create the GHRSST-PP products. This is referred to as satellite data integration (**SDI**) and implies the use of several standard data formats (e.g., HDF, netCDF, BUFR) and routines being made available to translate between them. Input from new and existing international SST research and development (**R&D**) activities form an essential input to all GHRSST-PP activities and will be fostered within the GHRSST-PP as a distinct activity.
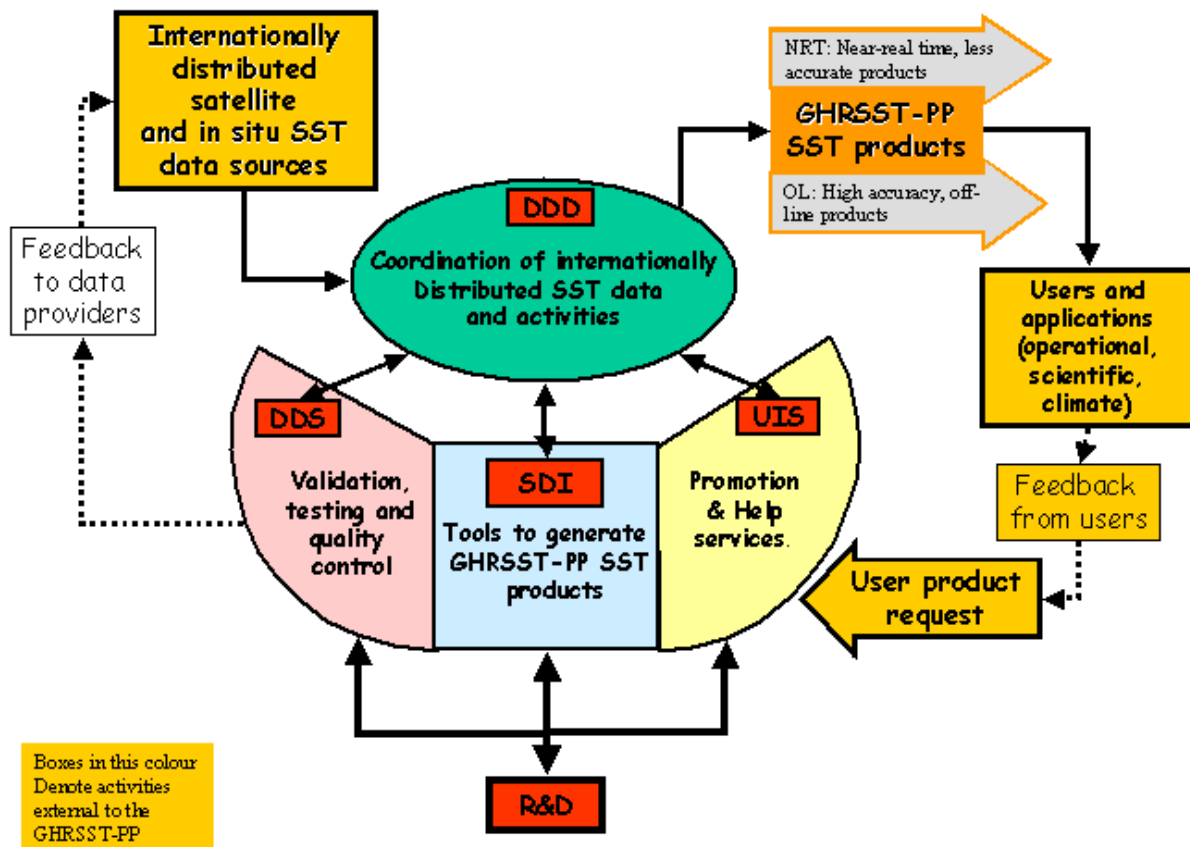
Figure 2.1 Schematic diagram showing the fundamental components of the GHRSST-PP.

The coordination and implementation preparations for the two-year enhanced observing period commenced at the first GHRSST-PP workshop at the end of 2000. Intensive preparations for the demonstration phase of the GHRSST-PP will continue throughout 2002 cumulating in a "version 1.0" of GHRSST-PP products and services that will be continually refined throughout the demonstration phase which continues until the end of the demonstration period (end of 2005). The following priorities are considered critical to the successful planning and implementation of the GHRSST-PP.

2.1 GHRSST-PP preparation phase (2002)

The GHRSST-PP preparation phase is mainly concerned with engaging and consolidating the GHRSST-PP community and implementation of the basic GHRSST-PP PPC. Figure 2.2 provides a work breakdown structure for the GHRSST-PP preparation phase that is expanded in detail using standard format work package tables in the following subsections. The preparation phase will be superseded by the GHRSST-PP demonstration phase in January 2003 described in Section 2.2.
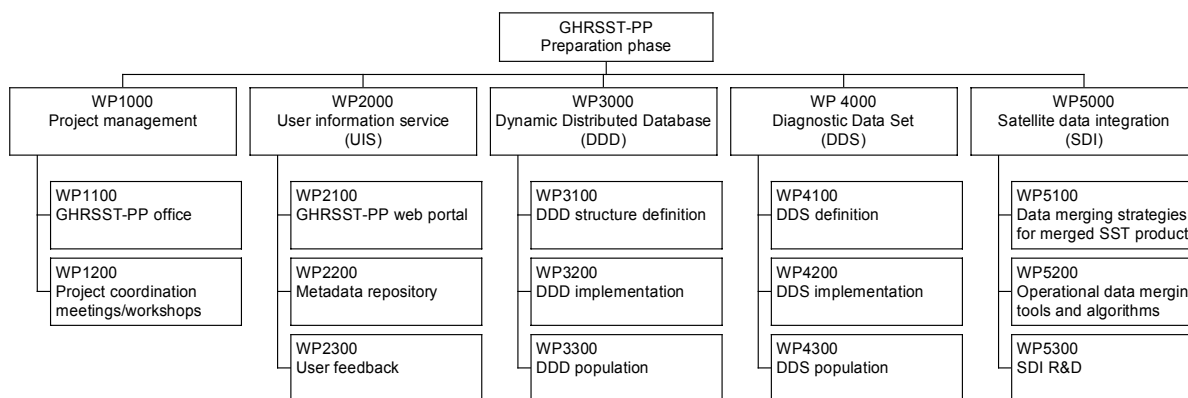
GHRSST-PP

Figure 2.2 GHRSST-PP preparation phase work package structure

2.1.1 WP1000: Project management and coordination

WP1000	TITLE	Project management and coordination of the GHRSST-PP	
Dependencies:			
Start date and starting event:		M0	(project start 2002)
End date and end event:		M48	(project end 2005/6)
Person-months:			
Responsibility:		**??**	
1	**Objectives:**		
	• Co-ordination and management of the GHRSST-PP • Provide scientific guidance to, and as appropriate receive advice from, the international GODAE steering team on the scientific and technical issues associated with the implementation of the project and on the use of products by GODAE. • Foster and coordinate the GHRSST-PP international consortium to undertake the implementation of the GHRSST-PP, including its final transition into an operational demonstration system. • Provide advice and guidance on scientific and technical innovations relevant to the GHRSST-PP. • Liaise as appropriate with other groups associated with the global ocean observing system, including the SST working group and surface flux project (SURFA) of the ocean observations panel for climate. • Provide regular reports on progress to the international GODAE steering team.		
2	**Methodology / work description:**		
	• Periodic meetings (electronic and physical as required) of the ST to review the project status, • Meetings of ad-hoc thematic workgroups, related to specific thematic and/or modular activities, • Use of automated computer messaging services (e-mail, mailing lists) • Development and use of the UIS for discussion and documentation sharing.		
3	**Deliverables:** •		
4	**Milestones:** •		

2.1.2 WP1100: Establish an international GHRSST-PP project office

WP1100	TITLE	Establish and operate a GHRSST-PP international office
Dependencies:		
Start date and starting event:	M0	
End date and end event:	M48 (Project end 2005/2006)	
Person-months:	1 x full time + 1 secretary @ ½ time	
Responsibility:		
1	**Objectives:**	
	• Provide a permanent base for the co-ordination and management of the GHRSST-PP • Provide a first point of contact and international focal point for the GHRSST-PP	
2	**Methodology / work description:**	
	• Operation of a GHRSST-PP international project office • Liaison and reporting to IGST • GHRSST-PP accounting • GHRSST-PP Science team management • Coordination with international agencies and projects • Coordination, editing and dissemination of GHRSST-PP monthly reports. • Coordination, editing and dissemination of GHRSST-PP technical reports	
3	**Deliverables:** •	
4	**Milestones:** •	

2.1.3 WP1200: GHRSST-PP project coordination through meetings and workshops

WP1200	TITLE	GHRSST-PP project coordination through meetings and workshops
Dependencies:	1100	
Start date and starting event:	M0	
End date and end event:	M48 (Project end 2005/2006)	
Person-months:		
Responsibility:		
1	**Objectives:**	
	• Organise regular meetings/teleconference between WP leaders and GHRSST-PP principal actors.	
2	**Methodology / work description:**	
	• Annual GHRSST- Science Team meeting • Workshops on dedicated topics • Meetings/teleconference between module/thematic coordinators	
3	**Deliverables:** •	
4	**Milestones:** •	

2.1.4 WP2000 Implementation of the GHRSST-PP user information service (UIS).

WP2000	TITLE	Implementation of the GHRSST-PP user information service (UIS)
Dependencies:		
Start date and starting event:	M0	project start
End date and end event:	M48	project end

Person-months:	
Responsibility:	
1	**Objectives:** • Provide WWW based user information service for the GHRSST-PP • To promote the GHRSST-PP and provide regular status and news reports. • To provide on-line metadata repository and query service for all GHRSST-PP data. • To provide basic on-line access to GHRSST-PP demonstration data products • To coordinate user feedback
2	**Methodology / work description:** • The UIS facility, which is in its most basic form a suite of WWW pages and a moderated on line discussion e-mail list, should be implemented at the start of 2002 in order to foster regular and active discussions as well as providing publicity and information of the GHRSST-PP. These pages should act as a focal point (portal) for the GHRSST-PP detailing aims objectives and the current status of the project. In addition, the DDD master index should be accessible from this site as part of theme II activities. • A metadata repository will be available that indexes all GHRSST-PP data that can be searched by a user. • GHRSST-PP data should be available through the UIS.
3	**Deliverables:** •
4	**Milestones:** •

2.1.5 WP2100 Establish GHRSST-PP web portal

WP2100	TITLE	Establish GHRSST-PP web portal	
Dependencies:			
Start date and starting event:		M0	project start
End date and end event:		M48	project end
Person-months:			
Responsibility:			
1	**Objectives:** • Provide WWW based information service for the GHRSST-PP		
2	**Methodology / work description:** • Establish WWW portal for the GHRSST-PP • Establish e-conference facilities • Establish dedicated discussion groups as required • Provide basic GHRSST-PP report dissemination and alert system.		
3	**Deliverables:** •		
4	**Milestones:** •		

2.1.6 WP2200 Establish GHRSST-PP metadata repository

WP2200	TITLE	WP2200 Establish GHRSST-PP metadata repository	
Dependencies:		2100,3000	
Start date and starting event:		M0	project start
End date and end event:		M48	project end
Person-months:			
Responsibility:			

1	Objectives:
	• Provide a searchable metadata repository serving the GHRSST-PP
2	Methodology / work description:
	• This should provide the location and a basic description of the content of data used within the project and could be linked to the Global Change Master Directory or other existing information data catalogue systems.
	• Develop protocols and services for the indexing and publication of GHRSST-PP metadata allowing easy location and extraction of GHRSST-PP data.
	• Maintain interoperability between internal project and external databases
	• Link and contribute to existing metadata repositories
3	Deliverables:
	•
4	Milestones:
	•

2.1.7 WP2300 Coordination of GHRSST-PP user feedback

WP2300	TITLE	Coordination of GHRSST-PP user feedback
Dependencies:		2100,1000?
Start date and starting event:		M0 project start
End date and end event:		M48 project end
Person-months:		
Responsibility:		
1	Objectives:	
	• To ensure that all user feedback/requests and problems are appropriately addressed by the relevant GHRSST-PP actor in good time	
2	Methodology / work description:	
	• Define points of contact for all groups in the GHRSST-PP to which user queries may be directed in the first instance	
	• Provide a tracking service that ensures all queries are appropriately closed.	
3	Deliverables:	
	•	
4	Milestones:	
	•	

2.1.8 WP3000: Implementation of the GHRSST-PP dynamic distributed database (DDD).

WP3000	TITLE	Implementation of the GHRSST-PP dynamic distributed database (DDD)
Dependencies:		WP2200
Start date and starting event:		M0 project start
End date and end event:		M48 project end
Person-months:		
Responsibility:		
1	Objectives:	
	• Establishment, maintenance, validation, description, accessibility, and distribution of international satellite and in situ SST data sets. The timely availability of source data is particularly important in this context.	
	• To coordinate all DDD activities	
2	Methodology / work description:	
	• The success of the GHRSST-PP will depend on scientists and agencies sharing their data with each other. The DDD should consider a wide variety of data formats and exchange protocols.	

	• The DDD system will be a flexible but evolving data exchange and delivery system. The chosen framework is capable of accommodating modifications to data at source (assuring the most current versions of all data are available to users and facilitating the management of data sets) as well as the changes in data requirements over the duration of the project. • In order to function effectively, the distributed GHRSST-PP data system must act as a coordinated entity which requires the development of a comprehensive and accessible master metadata index provided in WP2200	
3	Deliverables: • Progress reports • Technical reports • Workshops/meetings/teleconference as required	
4	Milestones: • The DDD should be implemented in a "version 1.0" form by the end of 2002 and preferably, be in an advanced functional form within the first quarter of 2003.	

2.1.9 WP3100: Structure for the dynamic distributed database (DDD).

WP3100	TITLE	Structure for the dynamic distributed database (DDD).
Dependencies:		WP2200
Start date and starting event:		M0 project start
End date and end event:		M48 project end
Person-months:		
Responsibility:		
1	Objectives:	• To provide a working structure for DDD implementation
2	Methodology / work description:	• Review and testing of available data infrastructures and data exchange services/protocols (e.g., ftp, DODS,LAS etc.) • Develop a data exchange and management system for the GHRSST-PP and making the data readily accessible to the scientific community using a multi-point, low cost access to relevant data, regardless of its location. • It is also foreseen that data may have to be exchanged in both an on-line and off-line modes.
3	Deliverables:	• Report providing recommendation of an optimal system/policy/strategy for the GHRSST-PP DDD implementation.
4	Milestones:	• Report by end of 2002

2.1.10 WP3200: Implementation of a dynamic distributed database (DDD).

WP3200	TITLE	Implementation of the GHRSST-PP dynamic distributed database (DDD)
Dependencies:		WP3100
Start date and starting event:		M0 project start
End date and end event:		M48 project end
Person-months:		
Responsibility:		
1	Objectives:	• To physically implement the GHRSST-PP DDD system
2	Methodology / work description:	•

3	Deliverables:
	• V1.0 system in place by the 1st quarter of 2003
4	Milestones:
	• V1.0 system in place by the 1st quarter of 2003

2.1.11 WP3300: Population and testing of the dynamic distributed database (DDD).

WP3300	TITLE	Population and testing of the dynamic distributed database (DDD).
Dependencies:		WP3200
Start date and starting event:		M0 project start
End date and end event:		M48 project end
Person-months:		
Responsibility:		
1	Objectives:	
	• To populate and test the GHRSST-PP DDD implementation	
2	Methodology / work description:	
	• Testing of data delivery and exchange using the DDD includes the configuration of "push" and "pull" data feeds to operational agencies and other activities within the GHRSST-PP.	
3	Deliverables:	
	• Report providing summary of DDD v1.0 performance and suggested enhancements of the system for the GHRSST-PP operational phase.	
4	Milestones:	
	• Population of the DDD should commence as soon as possible during the GHRSST-PP preparation phase.	
	• Report by end of 2002.	

2.1.12 WP4000: Implementation of the GHRSST-PP diagnostic data set (DDS).

WP4000	TITLE	Implementation of the GHRSST-PP diagnostic data set (DDS)
Dependencies:		WP2200,WP3200
Start date and starting event:		M0 project start
End date and end event:		M48 project end
Person-months:		
Responsibility:		
1	Objectives:	
	• To provide a GHRSST-PP DDS	
	• To coordinate all GHRSST-PP DDS activates	
2	Methodology / work description:	
	• The DDS concept provides a manageable suite of globally distributed data that will be used to derive and test satellite merging strategies, SST algorithm development and validation of source data and derived data products. It is foreseen that the DDS will be used extensively within the GHRSST-PP by many groups for these purposes and is arguably, together with the DDD, the core component of GHRSST-PP Themes III and IV. The DDS should be implemented within the framework of the DDD system.	
3	Deliverables:	
	• The DDS system which should be implemented in a functional form at the end of the second quarter of 2002.	
4	Milestones:	
	• V1.0 DDS by end second quarter 2002.	

2.1.13 WP4100: Structure of the GHRSST-PP diagnostic data set (DDS).

WP4100	TITLE	Structure of the GHRSST-PP diagnostic data set (DDS).
Dependencies:		WP2200,WP3200
Start date and starting event:		M0 project start
End date and end event:		M48 project end
Person-months:		
Responsibility:		
1	**Objectives:**	
	• To provide a working structure for DDS implementation	
2	**Methodology / work description:**	
	• Review and testing of available data infrastructures and data exchange services/protocols (e.g., ftp, DODS,LAS etc.) • Review of data indexing and storage formats best suited to the DDS • Liaison with data providers to assure appropriate data feeds • Define high resolution DDS areas • Consider data feeds	
3	**Deliverables:**	
	• Report providing recommendation of an optimal system/policy/strategy for the GHRSST-PP DDS implementation.	
4	**Milestones:**	
	• Report by end of 2002	

2.1.14 WP4200: Implementation of the GHRSST-PP diagnostic data set (DDS).

WP4200	TITLE	Implementation of the GHRSST-PP diagnostic data set (DDS).
Dependencies:		WP2200,WP3200,WP4100
Start date and starting event:		M0 project start
End date and end event:		M48 project end
Person-months:		
Responsibility:		
1	**Objectives:**	
	• To physically implement the GHRSST-PP DDS system	
2	**Methodology / work description:**	
	•	
3	**Deliverables:**	
	• V1.0 system in place by the 1st quarter of 2003	
4	**Milestones:**	
	• V1.0 system in place by the 1st quarter of 2003	

2.1.15 WP4300: Population and testing of the GHRSST-PP diagnostic data set (DDS).

WP4300	TITLE	Population and testing of the GHRSST-PP diagnostic data set (DDS).
Dependencies:		WP4200
Start date and starting event:		M0 project start
End date and end event:		M48 project end
Person-months:		
Responsibility:		
1	**Objectives:**	
	• To populate and test the operational DDS implementation	

2	**Methodology / work description:** • Testing of data delivery and exchange to/from the DDS. Includes the configuration of "push" and "pull" data feeds to operational agencies and other activities within the GHRSST-PP.
3	**Deliverables:** • Report providing summary of DDS v1.0 performance and suggested enhancements of the system for the GHRSST-PP operational phase.
4	**Milestones:** • Population of the DDS should commence as soon as possible during the GHRSST-PP preparation phase. • Report by end of 2002.

2.1.16 WP5000: Development of the GHRSST-PP satellite data integration system (SDI)

WP5000	TITLE	Development of the GHRSST-PP satellite data integration system (SDI)
Dependencies:		
Start date and starting event:		M0
End date and end event:		M48 (Project end 2005/2006)
Person-months:		
Responsibility:		
1	**Objectives:** • To provide coordination to all SDI activities	
2	**Methodology / work description:** • The objective of these activities is to address the science questions identified for data merging, product algorithms, product validation and cloud clearing strategies and specify suitable algorithms for implementation by the SDI. • Many of these activities are currently active in national projects (e.g., merging of IR and PM data, cloud clearing strategies based on the use of time series data and combinations of IR and PM data sets).	
3	**Deliverables:** •	
4	**Milestones:** •	

2.1.17 WP 5100: Version 1.0 SDI tools and methods

WP5100	TITLE	Version 1.0 SDI tools and methods
Dependencies:		WP3300,WP4300
Start date and starting event:		M0
End date and end event:		M48 (Project end 2005/2006)
Person-months:		
Responsibility:		
1	**Objectives:** • To provide R&D demonstration methodologies that can be used to generate the GHRSST-PP products.	
2	**Methodology / work description:** • Initial activities will focus on the development of a suitable suite of software tools to implement the v.1.0 algorithms specified by the GHRSST-PP. • It is expected that these tools will make use of the currently available data sets compiled by various agencies (ATSR, TMI, Pathfider etc.) within the DDD and DDS.	

	•	A tested version 1.0 suite of algorithms should be developed and validated. More advanced algorithms will be developed, tested and implemented throughout the lifetime of the GHRSST-PP.
3	**Deliverables:** • A tested version 1.0 suite of algorithms should be available by the start of the GHRSST-PP demonstration phase.	
4	**Milestones:** • January 2003 demonstration phase start using v1.0 SDI.	

2.1.18 WP 5200: Development of operational 1.0 SDI tools and methods

WP5200	**TITLE**	Development of operational 1.0 SDI tools and methods
Dependencies:		WP3300,WP4300,WP5100
Start date and starting event:		M0
End date and end event:		M48 (Project end 2005/2006)
Person-months:		
Responsibility:		
1	**Objectives:**	
	•	To provide operational SST data merging methodologies that will be used during the demonstration phase to generate the GHRSST-PP products.
2	**Methodology / work description:**	
	•	Refinement of v1.0 SDI algorithms that provide the best operational solution.
	•	A tested version 2.0 suite of algorithms should be developed and validated. More advanced algorithms will be developed, tested and implemented throughout the lifetime of the GHRSST-PP.
3	**Deliverables:**	
	•	A tested version 2.0 suite of algorithms.
4	**Milestones:**	
	•	

2.1.19 WP 5300: Implementation of operational SDI tools

WP5300	**TITLE**	Implementation of operational SDI tools
Dependencies:		WP3300,WP4300,WP5100,WP5200
Start date and starting event:		M0
End date and end event:		M48 (Project end 2005/2006)
Person-months:		
Responsibility:		
1	**Objectives:**	
	•	To implement the GHRSST operational SDI toolkit in an operational context.
2	**Methodology / work description:**	
	•	
3	**Deliverables:**	
	•	
4	**Milestones:**	
	•	

2.2 GHRSST-PP demonstration phase (2003-2005)

During the demonstration phase of the GHRSST-PP, the emphasis is to provide GHRSST-PP SST data sets according to the strategy outlined in the thematic work program. Throughout the demonstration phase, a parallel and continual process of project development and refinement is foreseen with particular emphasis on the improvement of demonstration data products and delivery to operational users. This will be achieved by maintaining careful and comprehensive validation of both GHRSST-PP products, using in situ and satellite observations within the DDS and, a validation of the GHRSST-PP itself in terms of attaining the overall objectives of the project. The following priority activities have been identified:

- *Production* of SST products
- *Delivery* of SST products
- *Validation* of SST products
- *Evaluation* of the GHRSST-PP

2.2.1 Extension of UIS system

The UIS system should be maintained and where appropriate, extended to cover all aspects of the GHRSST-PP. Particular attention should be paid to ensuring that the UIS is a functional and useful resource for all parties associated with the GHRSST-PP rather than becoming a bloated set of marginal web pages. This requires careful thought and liaison with users and data producers.

2.2.2 Continued development of v1.0 SDI

It is unrealistic to expect that the SDI will be fully implemented at the start of the demonstration phase of the project as there are particularly demanding scientific and methodological questions to address. Therefore, it is foreseen that the SDI will continue to evolve over the course of the GHRSST-PP drawing on input from users and all scientific activities irrespective of those within the GHRSST-PP itself. In particular, the use of the DDS as a means to evaluate the SDI methodology will be a major component of this activity.

2.2.3 RT & OfL SST Product generation

The major distinction between the preparation phase and the demonstration phase of the GHRSST-PP is the generation and delivery of data products during the demonstration phase of the GHRSST-PP. These activities are expected to evolve rapidly during the initial part of 2002 so that a stable system is established. However, it is also expected that this will be in a constant state of change as new users request different products as more experience is accumulated throughout the project.

2.2.4 Delivery of GHRSST-PP products

A closely related but nevertheless, independent activity, is the continued evolution of the GHRSST-PP data delivery and exchange system. In effect this requires the input of data users and will entail the tuning of the GHRSST-PP DDD to the particular needs of users (e.g., push and pull data streams in a particular format). This will be an evolutionary process as both users and the GHRSST-PP establish optimal data exchange protocols and systems.

2.2.5 GHRSST-PP product validation

The objective of this priority activity is to provide a quantitive validation of the GHRSST-PP demonstration data products using both in situ and satellite data. Validation is expected to assess the accuracy of demonstration data products, the validity of data merging strategies, cloud clearing methodology and the timeliness of data provision. It should result in clear statements at regular intervals specifying the spatial and temporal resolution and accuracy Improvements to SST data. The basis for much of this work is described in Theme II and III of the GHRSST-PP strategy and

focuses on the analysis of data within DDS system. The results of this exercise are expected to feedback into all other activities of the GHRSST-PP.

2.2.6   Evaluation of the GHRSST-PP

This priority activity will critically review the GHRSST-PP in order to assess how well the project is actually achieving its aims and objectives. This activity is started early on in the demonstration phase in order to have the possibility of addressing rapidly emerging problems early in the project. It will in particular, assess the usefulness of GHRSST-PP products by reviewing the successful application of these in the operational and scientific community as a whole. This will provide a validation of "user satisfaction" based on data delivery, product application, user comments and suggestions. It will also focus on obtaining a measure of the improved prediction skills achieved by operational models using GHRSST-PP data.

3   Funding the GHRSST-PP

3.1   Estimated budget

STAFF COSTS	Total	2002	2003	2004	2005
Project coordinator					
Thematic Coordinator (x4)					
TOTAL					

Table 3.1 GHRSST-PP staff costs

HARD INFRASTRUCTURE COSTS	Total	2002	2003	2004	2005
TOTAL					

Table 3.2 GHRSST-PP hard infrastructure costs

SOFT INFRASTRUCTURE COSTS	Total	2002	2003	2004	2005
Workshop					
Meetings					
TOTAL					

Table 3.3 GHRSST-PP soft infrastructure costs

3.2   Funding sources

TBD

4   Metrics for the GHRSST-PP

TBD

5 Schedule for the GHRSST-PP

|	2002				2003				2004				2005			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Preparation Phase																
Implementation of DDD (DODS&FTP)																
Implementation of DDS																
Implementation of basic UIS																
Population of DDD and DDS																
Testing of data delivery & exchange																
Version 1.0 SDI tools and methods																
Development of RT & OfL SST Algorithms (R&D)																
Demonstration Phase																
Extension of UIS system																
Continued development of v1.0 SDI																
RT & OfL SST Product generation																
GHRSST-PP product validation																
Validation of GHRSST-PP																
Delivery of GHRSST-PP products																

Figure 5.1 General schedule for the implementation of the GHRSST-PP preparation and operational phases.

6 Final assessment of the GHRSST-PP

The co-ordination and synchronisation of international activities related to the synergistic use of satellite data is fundamental to global environmental monitoring. The success of the GHRSST-PP will be judged primarily on the completeness of a new generation merged high-resolution SST maps that constitute the overall deliverable of the project. Their wide application, and in particular, the use of NRT high resolution data sets to the operational oceanographic and meteorological community data assimilation activities, will provide an unequivocal demonstration of the project success. However, before this can occur, it is clear that the GHRSST-PP, as an experiment, should lead to conclusions and recommendations that effectively guide the future developments of:

(i) New satellite missions concerned with the measurement of SST,
(ii) International coordination for the production of SST data sets,
(iii) Delivery and exchange of large data sets to the scientific and user community,
(iv) Targeted research and development of satellite derived SST,
(v) Validation and calibration of individual satellite sensors and data streams,
(vi) Requirements for a sustained operational global SST data service.

7 International activities contributing to the GHRSST-PP

There are a number of relevant research projects and programs, both ongoing and planned, that are foreseen to have a significant role within the GHRSST-PP. The following list describes current activities and identified projects relevant to the GHRSST-PP:

Activity	Contact	Status
Development and implementation of the GHRSST-PP diagnostic Data Set	EC-JRC, (C Donlon)	Active
Provision of MCSST and AVHRR brightness temperature data.	D. May, NAVOCEANO	In prep
Provision of TRMM TMI data products to the DDD and DDS	Remote Sensing Systems, (C. Gentemann)	Active

Eumetsat Ocean and Sea Ice (OSI) Satellite Application Facility (SAF) activities	P. LeBorgne, MeteoFrance	In prep
Access and use of ISCCP IR global brightness temperature data sets.	ISCCP, (B. Rossow)	In prep
Contribution to DDS sites, development of new products	NASDA (H. Kawamura)	In prep
Support to the development of the GHRSST-PP DDS	NASDA (I. Asanuma)	In prep
Provision of TRMM, AMSR/ADEOS-II, AMSR-E/AQUA SST and GLI/ADEOS-II SST	NASDA (H. Kawamura)	In prep
SDI merging tools and SST products for the global oceans and the western North Pacific	Tohoku University and NASDA (H. Kawamura)	In prep
Support and collaboration for DDS activities	SIMBIOS (J. Campbell)	Active
SSTskin SOO validation in European waters (ISAR project part of ENVISAT AATSR)	SOC (I. Robinson)	Active
THIRST proposal (part of Theme I module I-i)	SOC (I. Robinson)	In prep
SSTskin SOO validation in the Caribbean (M-AERI, part of MOIDIS validation)	RSMAS (P. Minnett)	Active
Provision of MODIS SST data sets	RSMAS (R. Evans)	In prep
Miami Pathfinder match up database	RSMAS (G. Podesta)	Active
Provision of ATSR ASST global data sets	RAL (C. Mutlow)	Active
Provision of Pathfinder ST data	JPL,PODAAC (J. Vazquez)	Active
SSTskin SOO validation activities (Pacific)	APL (A. Jessup)	In prep
R&D studies for merging IR & PM data	RSS, (C. Gentemann)	Active
R&D studies for merging IR and PM data	NOAA (G. Wick)	Active
R&D studies for merging IR and PM data	JRC (C. Donlon)	Active
R&D studies for merging satellite data	Meteo France SAF P. LeBorgne	Active
Provision of AVHRSS MCSST data	Navocean (D. May)	Active
Use of GHRSST-PP in operational models	UK Met. Office (N Rayner)	In prep
SST validation in Australian waters	CSIRO (Barton)	Active
R&D for satellite data analysis techniques	CSIRO(Barton)	Active
MODIS match-up database	RSMAS (Evans et al)	In prep

Table 7.1 Activities and projects within the GHRSST-PP (2000-2005)

8   GHRSST-PP contacts

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